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# (54) Process for obtaining artificial stone for flooring and stone facing

(57) A process for obtaining artificial stone for flooring and facing, comprises grinding marble and mixing it with silica sand and optionally additional material, such as glass, porcelain, swarf, hardwood modules or plastics, and with a polymerizable resin; moulding the mixture thus obtained by a combined vibration and compression action under vacuum; and effecting polymerization of the resin. The marble is ground to a maximum size of approximately 7 mm, and the silica sand is subjected to severe heating prior to mixing.

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# PROCESS FOR OBTAINING ARTIFICIAL STONES FOR FLOORING AND STONE FACING

The invention relates to a process for obtaining artificial stones for flooring and stone facing and to stones thus obtained.

Artificial stones, also termed artificial marbles, are widely used in the building industry, e.g. in tile form for flooring or stone facing and are largely adopted as they provide a considerable aesthetic value provided for by compositions of uniform appearance and quality, which is not the case with natural stony materials.

An object of the present invention is to provide a process which makes it possible to produce artificial stones, on industrial scale by using systems even of a known type thereby obtaining a product, both in block and slab form, which has good technological characteristics, such as acid, shock and flexing resistance and weatherability as well as high abrasion resistance.

The above mentioned object is achieved by a process for obtaining artificial stones for flooring and stone facing, according to the invention, which comprises a step of crushing or grinding marble material, a step of mixing said crushed material with additional substances with at least one polymerizable resin, a step of moulding the mixture thus obtained by a combined vibration and compression action under vacuum, and a step of resin polymerization for the hardening of the or each resin, characterized in that the crushed marble has a maximum particle size of 7 mm and said additional substances include silica sand which has been previously subjected to strong

heating.

A particularly suitable type of silica sand is that obtained as waste, and in large amounts, in foundries where the so-called sand casting is performed, i.e. casting of metal into moulds substantially made of silica sand. During casting the silica sand is subjected to severe heating, particularly in the regions in contact with the molten metal. The moulds are then broken to extract the casting and they become waste matter. Such a silica sand which has been subjected to severe heating is suitably treated to remove from it residues of amidines and bentonite and other powder materials.

Advantageously, calcareous powder may be added to the mixture together with crushed marble, silica sand and resin. The final product can take a look quite effective from the aesthetical point of view if colouring and/or additive materials are added, e.g. metallic swarf, pieces of ceramics or other materials having regular, geometric or a repetitive configuration or any configuration.

Further characteristics and advantages of the present invention will become better apparent from the following description of some embodiments by illustrated by way of non-limitative examples.

EXAMPLE 1

The following components are mixed together:

- cruched or ground marble with maximum particle size of 1.75 mm, and thus having granulometric dimensions ranging from impalpable dust to granules with maximum dimensions of 1.75 mm: 85 kg
- silica sand which has been subjected to severe

heating; silice sand available as waste material obtained from broken casting moulds as used in the so-called sand casting is quite suitable for this purpose; 15 kg

- polyester resin including a catalyst and an accelerator: 8 kg

Such a mixture is then moulded by vibrocompression under vacuum at approximately 500 tonnes/sq.m. according to a method known per se and allow to harden by heat polymerization. Well-amalgamated slabs are thus obtained having good mechanical strength, no cracks or strains and high abrasion resistance, i.e. in the neighbourhood of that of natural granite.

The product thus obtained has valuable aesthetic qualities by virtue of its uniform distribution of dark spots of various sizes in a lighter background owing to the presence of the silica sand treated as specified above.

The slab-like product thus obtained is an excellent flooring or facing material.

EXAMPLE 2

One proceeds as in Example 1, but a colouring material (known per se) in an amount equal to 10% by weight of polyester resin, i.e. an amount of 0.8 kg, is added to the mixture.

The addition of the colouring material, which may be of various colours and shades, contributes to the aesthetic value of the end products without affecting their physical properties and their performance.

EXAMPLE 3

The following components are mixed together:

- ground marble with maximum particle size of 1.75 mm: 60 kg
- silica sand as in Example 1; 40 kg
- polyester resin including a catalyst and an accelerator: 7.5 kg

The same procedure as in Example 1 is followed. A slab-like element having an abrasion resistance similar to that of natural granite is obtained.

EXAMPLE 4

The following components are mixed together:

- black marble ground to a maximum particle size of 3.5 mm: 60 kg
- silica sand as in Example 1 30 kg
- impalpable calcareous powder ($CaCO_3$): 10 kg
- polyester resin including a catalyst and an accelerator 7.75 kg

One then proceeds as in Example 1. A slab-like product is obtained that has good mechanical characteristics and an abrasion resistance which is intermediate between the values obtained when following the methods of Examples 1 and 3.

EXAMPLE 5

One proceeds as described in any Example 1 to 4, but an amount of 10 kg of pieces of additive material of various types, configurations and sizes is added, i.e. comprising metallic fragments, glass, glass fiber, mother-of-pearl, nodules of hardwood, hard plastics, even with regular and/or geometrical or in any way repetitive configuration, fine gravel, ceramics, porcelain, fragmented granite, artificial or natural mica.

The purpose achieved by adding said materials in pieces

is to impart to the end product a specific appearance and aesthetic value which can thus be preselected and programmed in advance.

EXAMPLE 6

The following components are mixed together:

- black marble ground to a maximum particle size of 3 mm 60 kg
- silica sand as in Example 1 15 kg
- fragmented granite with particle size up to 6 mm 15 kg
- calcareous powder 10 kg
- polyester resin including a catalyst and an accelerator 7.60 kg

One then proceeds as in Example 1. A product is thus obtained which is quite vividly coloured and has a greater abrasion resistance than the products obtained in accordance with the previously described Examples.

As already specified, the marble used in the above described Examples, can be of any type, and therefore even crystalline or granular marble. Carrara and Lasa marbles are particularly suitable for the purpose.

The material obtained with the process according to the invention can be in the form of a finished slab, as in the above described Examples, or an agglomerate block which is subsequently sawn and polished. Of course, this depends on the type of apparatus used to carry out the process.

CLAIMS

1. Process for obtaining artificial stones for flooring and facing, which comprises a step of crushing or grinding marble material, a step of mixing of said crushed material with additional materials with at least one polymerizable resin, a step of moulding the mixture thus obtained by a combined vibration and compression action under vacuum, a step of resin polymerization for the hardening of the or each resin, characterized in that the crushed marble has maximum particle size of about 7 mm, and in that the additional substances include silica sand which has been subjected to severe heating.

2. Process according to claim 1, characterized in that said silica sand is obtained from casting moulds used in the so-called sand casting.

3. Process according to claim 1 or 2, characterized in that the or each polymerizable resin comprises polyester resin, a catalyst and an accelerator, in a percentage by weight ranging from 5% to 12%.

4. Process according to any preceding claim, characterized in that the said additional materials include impalpable calcareous powder.

5. Process according to any preceding claim, characterized in that the said additional materials include a colouring agent compatible with the or each resin in a percentage ranging from 0.5% to 20% by weight with respect to said resin.

6. Process according to any preceding claim, characterized in that the said additional materials include relatively hard inert material in loose pieces in an amount

between 0.5% and 20% by weight with respect to the ground marble.

7. Process according to claim 6, characterized in that said additional materials comprise swarf.

8. Process according to claim 6, characterized in that said additional materials comprise glass or glass fiber pieces.

9. Process according to claim 6, characterized in that said additional materials comprise pieces of mother-of-pearl and/or ceramic and/or porcelain.

10. Process according to claim 6, characterized in that said additional materials comprise hardwood nodules.

11. Process according to claim 6, characterized in that said additional materials comprise fine gravel.

12. Process according to claim 6, characterized in that said additional materials comprise pieces of hard plastics.

13. Process according to claim 6, characterized in that said additional materials comprise fragmented granite.

14. Process according to claim 6, characterized in that said additional materials comprise pieces of natural or artificial mica.

15. Artificial stone in block or slab form, when obtained by the process according to any preceding claim.

16. Process for obtaining artificial stones for flooring and facing, substantially as described and illustrated in the above Examples 1 to 6.

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